

## CLAIMS

What is claimed is:

1. A system able to determine whether a selected agent is present in  
5 an atmosphere, the system comprising:
  - an atmosphere collector component to collect a selected amount of  
the atmosphere;
  - an agent contacting component such that the agent is able to  
interact with a selected tag to form at least one of an interacted tag and an  
10 uninteracted tag;
  - a grouping component to substantially form a group of at least one  
of the interacted tag and the uninteracted tag;
  - a detection component to determine the presence of the selected  
agent from the sample;
  - 15 wherein the separation system is able to separate the interacted tag  
and the uninteracted tag for detection by said detection system;
  - wherein said detection system is able to provide an output in a  
selected format.

2. The system of claim 1, wherein said atmospheric collector component includes:

an atmosphere intake portion to intake a portion of the atmosphere and, if present, the selected agent; and

5 an atmosphere storage portion adapted to store the collected portion of the atmosphere.

3. The system of claim 2, further comprising:

10 a sample concentrator to at least one of concentrate the selected agent and remove an excess portion of the atmosphere collected.

4. The system of claim 1, wherein said each contacting component includes:

15 a mixing chamber to mix the collected amount of the atmosphere with the selected tag to allow for substantial interaction between the selected tag and the agent when present.

5. The system of claim 4, wherein the agent contacting component further includes:

20 a mixer selected from at least one of a physical stirrer, a vibrational device to vibrate the mixing chamber, and an ultrasonic mixer to provide ultrasonic waves to the mixing chamber;

wherein said mixer provides a mixing of the collected amount of the atmosphere and the selected tag.

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6. The system of claim 1, wherein said agent contacting component further includes:

a mixing chamber; and

30 an injector to inject a selected amount of a liquid into the mixing chamber;

wherein the collected amount of the atmosphere is mixed with the liquid that is injected from the injectors prior to analysis of the collected amount of the atmosphere.

7. The system of claim 6, wherein the injector further injects the selected tag into the mixing chamber to interact with the agent when the agent is present.

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8. The system of claim 1, wherein said grouping component, when an interacted tag is present, is able to group the interacted tag and the uninteracted tag into substantially discrete groups;

wherein the interacted tag exists substantially only when the collected amount of the atmosphere includes the selected agent.

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9. The system of claim 1, wherein said grouping component is able to group at least the interacted tag and the uninteracted tag using at least one of a centrifugal force, a dielectrophoresis force, a chromatography, a mass spectrometry, and combinations thereof.

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10. The system of claim 9, wherein the grouping component groups the at least one of the interacted tag and the other uninteracted tag using both a centrifugal force and a dielectric force;

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wherein the centrifugal force creates a force vector in a first direction and the dielectric force creates a force vector in a second direction; wherein said first direction is different from said second direction.

11. The system of claim 1, wherein said detection component includes:  
an excitation source to excite the selected tag; and  
an emission detection portion to detect an emitted energy from the selected tag.

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12. The system of claim 11, wherein said excitation source emits a wave length of greater than about 900 nm;

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wherein said detection portion detects a wave length less than about 900 nm.

13. The system of claim 1, wherein the output is at least one of a human readable format and a computer recognizable format;

wherein said human readable format provides feedback to a user to determine the presence of the selected agent.

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14. The system of claim 1, wherein said agent contacting component is able to contact a plurality of types of said tags with a plurality of types of the selected agent; and

said the detection component is able to detect and distinguish  
10 between said plurality of types of the tags to determine the presence of a plurality of types of the selected agent.

15. The system of claim 1, further comprising:

a carrier fluid to transfer the selected agent through the atmosphere  
15 collector component, the agent contacting component, and to the grouping component;

wherein said carrier fluid is selected from at least one of a gas and a liquid.

20 16. The system of claim 15, wherein the detection component is able to determine the presence of the selected agent in less than about two minutes after said atmosphere collector component has collected the selected amount of the atmosphere.

25 17. The system of claim 1, wherein the selected tag is an up-converter.

18. The system of claim 17, wherein the selected tag is able to absorb a first wavelength and emit a second wavelength, wherein said first wavelength is greater than said second wavelength.

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19. An apparatus to determine and signal the presence of a selected aerosolized agent, comprising:

an atmosphere collection system able to collect a selected amount of an atmosphere;

5 a collection area to hold the selected amount of the atmosphere to substantially ensure a detectable amount of the agent when present;

a tag able to interact with the agent;

a tagging system able to form at least one of an interacted tag and an uninteracted tag;

10 a separation system to form a population of at least one of the interacted tag and the uninteracted tag; and

a determining system to determine the presence of the at least one of the interacted tag and the uninteracted tag;

15 wherein said interacted tag generally occurs when the selected agent is present in the atmosphere;

wherein the detection of substantially the uninteracted tag signifies the absence of the agent from the atmosphere.

20. The apparatus of claim 19, wherein said atmosphere collection system includes:

an intake system selected from at least one of a fan and an impeller; and

5 a motor to selectively drive said intake system;

wherein said intake system drives the collected amount of the atmosphere into the collection area for later analysis.

21. The apparatus of claim 19, wherein said collection area includes:

10 a concentrator to at least one of concentrate the aerosolized agent, if the aerosolized agent is present in the collected amount of the atmosphere, and remove a selected portion of the collected amount of the atmosphere.

22. The apparatus of claim 21, wherein said concentrator is able to

15 transfer the concentrated aerosolized agents to be tagging system, if the aerosolized agent is present, to be interacted with said tag.

23. The apparatus of claim 19, wherein said tag is able to substantially

20 bind with the selected aerosolized agent to form an interacted tag for separating with said separation system.

24. The apparatus of 19, wherein said separation system forms at least

one of a first population of the interacted tag and a second population of the uninteracted tag.

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25. The apparatus of claim 19, wherein said separation system forms

said population with at least one of a centrifugal force, a dielectricphoresis force, a chromatography, a mass spectrometry, and combinations thereof.

26. The apparatus of claim 25, wherein the separation system forms said population with a centrifugal force and a dielectrophoresis force;

wherein said centrifugal force applies a force to said at least one of the interacted tag and the uninteracted tag in a first direction and said  
5 dielectrophoresis force applies a force to the other of said at least one of the interacted tag and the uninteracted tag in a second direction;

wherein said first direction and said second direction are different.

27. The apparatus of claim 19, wherein said determining system  
10 determines the presence of at least one of a first population of the interacted tags and a second population of the uninteracted tag;

wherein the detection of said first population of the interacted tag and the second population of the uninteracted tag allows said determining system to determine the presence of the selected aerosolized agent.

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28. The apparatus of claim 19, further comprising:

a substantially dry carrier fluid to move the aerosolized agent to said separation system;

wherein said determining system is able to determine the presence  
20 of the selected aerosolized agent within about two minutes after said atmosphere collection system has collected the selected amount of the atmosphere.

29. The apparatus of claim 19, wherein said determining system further includes:

25 an excitation source to excite at least one of the interacted tag and the uninteracted tag; and

a detection system to detect an emitted energy from the at least one of interacted tag and the uninteracted tag.

30. The apparatus of claim 29, wherein said excitation source provides an excitation energy at a wave length of greater than about 900 nm;

wherein said detection apparatus detects a wave length of less than about 900 nm.

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31. The apparatus of claim 19, wherein said tagging system includes:  
a mixing apparatus to mix the collected atmosphere sample with said tag.

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32. The apparatus of claim 19, wherein said tag includes a plurality of tags including at least a first sub-plurality and a second sub-plurality of said plurality of said tags;

wherein said first sub-plurality interacts substantially only with a first selected aerosolized agent;

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wherein said second sub-plurality of said plurality of tags interacts substantially only with a second selected aerosolized agent.



33. A system for the determination of the presence of a selected agent, comprising:

a collection component to collect at least one of a selected volume of the selected agent and a selected number of the selected agent;

5 a tagging component to interact a plurality of a tag with the at least one of the selected volume and the selected number of the selected agent to form at least one of an interacted tag and an uninteracted tag;

a grouping component to form a group of at least one of the interacted tag and the uninteracted tag, including:

10 a centrifugal force forming member operably interconnected with said tagging system; and

a dielectric force forming system to operate generally in concert with said centrifugal force forming member;

15 wherein said grouping system forms the group of at least one of the interacted tag and the uninteracted tag with both a centrifugal force and a dielectric force.

34. The system of claim 33, wherein said tagging system, includes:  
a mixing system to substantially mix said tag with the at least one of  
selected volume of the selected agent and the selected number of the selected  
agent;

5 wherein mixing said tag with said at least one of the selected  
volume of the selected agent and the selected number of the selected agent  
provides for at least a portion of said tag to form said interacted tag.

35. The system of claim 33, wherein said grouping system separates  
10 said interacted tag from said uninteracted tag using a mass separation in said  
centrifugal force forming member wherein said interacted tag generally has a  
mass different than said uninteracted tag.

36. The system of claim 33, wherein said grouping system uses a  
15 dielectric force to further separate said interacted tag from said uninteracted tag  
wherein said interacted tag has a dielectric different than said uninteracted tag.

37. The system of claim 33, wherein said grouping system separates  
said interacted tag and said uninteracted tag in a fluid that is substantially free of  
20 a liquid;

wherein said grouping system is able to form said groups in less  
than about two minutes after the collection of the at least one of the selected  
volume of the selected agent and the selected number of the selected agent.

25 38. The system of claim 33, wherein:  
said collection system is able to collect a plurality of types of the  
selected volume of the selected agent and the selected number of the selected  
agent;

said tagging system is able to interact with said plurality of said tags  
30 discretely with said plurality of types of said selected agents.

39. The system of claim 38, wherein said grouping system forms a group of a plurality of said interacted tag and a group of said plurality of uninteracted tag groups depending upon the type of the selected agent.

5           40. The system of claim 39, further comprising:  
              an analysis system able to determine the type of said various types of the selected agents.

              41. The system of claim 33, further comprising:  
10           an analysis component that determines the presence of the at least one of the interacted tag and the uninteracted tag after the groups have been formed by said grouping system.

42. The system of claim 33, wherein said tag is an up-converter.

43. A method of determining the presence of a selected agent in an atmospheric sample with a system including a sample collector, a sample tagger, a sample separator, and a detection component. the method comprising:

5       collecting an atmospheric sample of a selected size of an atmosphere;

          mixing a tag with the atmospheric sample;

          forming at least one of an interacted tag and an uninteracted tag;

          forcing the formation of a collection of at least one of the interacted tag and the uninteracted tag;

10       detecting the presence of the collection of at least one of the interacted tag and the uninteracted tag; and

          outputting the result of the detection;

          wherein an interacted tag is formed generally only in the presence of a selected agent.

44. The method of claim 43, further comprising collecting the selected agent from the collected atmospheric sample for mixing with a tag.

5           45. The method of claim 44, further comprising:  
              concentrating the selected agents from the atmospheric sample for mixing with a tag.

              46. The method of claim 43, wherein mixing a tag with the atmospheric  
10 sample includes:  
              generally contacting the tag with the selected agent from the atmospheric sample.

              47. The method of claim 43, wherein forming at least one of an  
15 interacted tag and an uninteracted tag includes:  
              binding the tag to the selected agent to form the interacted tag.

              48. The method of claim 43, wherein forcing the formation of a  
collection of at least one of the interacted tag and the uninteracted tag includes:  
20           separating said interacted tag from said uninteracted tag using a mass differential between said interacted tag and said uninteracted tag.

              49. The method of claim 43, wherein forming at least one of an  
interacted tag and said uninteracted tag includes:  
25           separating said interacted tag from said uninteracted tag based upon a dielectric constant differential between said interacted tag and said uninteracted tag.

              50. The method of claim 43, wherein forcing the formation of a  
30 collection of at least one of an interacted tag in said uninteracted tag includes:  
              separating said uninteracted tag from said interacted tag using both a mass separation and a dielectric force separation.

51. The method of claim 43, wherein forming the uninteracted tag includes not contacting the tag with the selected agent.

52. The method of claim 43, wherein detecting the presence of the  
5 collection includes:

exciting said tag to force said tag to form an emission energy; and  
detecting the emission energy from the excited tag.

53. The method of claim 52, further comprising:  
10 determining the presence of more than one collection;  
wherein the presence of more than one collection allows for a  
determination of the presence of the selected agent.

54. The method of claim 43, wherein outputting the result of the  
15 detection includes outputting the presence of one or more collection.

55. The method of claim 43, wherein collecting an atmospheric sample  
includes collecting a plurality of types of the selected agent;  
wherein each of the type of selected agent relates to a selected  
20 detectable species.

56. The method of claim 54, wherein mixing a tag with the atmospheric  
sample includes:  
mixing a plurality of types of tags with the plurality of types of  
25 selected agents;  
wherein each of the types of the plurality of tags interacts with  
substantially only a single type of the plurality of selected agents to form a  
plurality of types of interacted tags.

57. The method of claim 43, wherein forcing the formation of a  
30 collection includes forming a formation of a collection in a fluid that is  
substantially dry.

58. The method of claim 43, wherein said tag is an up-converter.

59. The method of claim 43, further comprising:

inducing an emission of a first wavelength from at least one of said  
5 interacted tag and said uninteracted tag with a second wavelength;  
wherein said first wavelength is less than said second wavelength.